CACHE-A

Prime-Cache / Pro-Cache
LTO Data Tape Deck
Archive Appliance
Getting Started Guide

July 28, 2010

Cache-A A-Series Archive Appliance Getting Started Guide CA-P4011.

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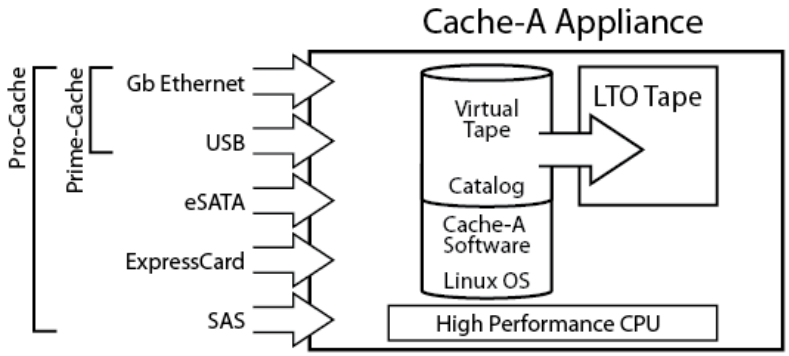
Chapter 1: Introduction

Cache-A archive appliances were created to provide an easy and flexible means for archiving, backing up and restoring data. Stand-alone LTO-4 based systems are appropriate for users with anticipated requirements to archive from tens to hundreds of Terabytes of data.

Cache-A archive appliances are designed to assist video and other media professionals meet their needs in storing and archiving large image content files. These archive appliances are able to store and share all forms of computer data including high definition and standard definition video files for video production and archiving.

System Architecture

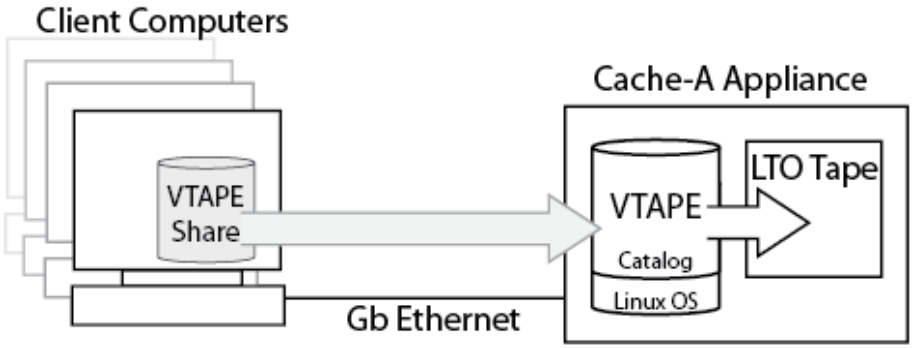
Cache-A archive appliances are comprised of a hard disk drive (or array), an LTO-4 Data Tape drive, a high performance compact computer server running Fedora Linux, and a variety of external interfaces. These components are packaged with a file tracking catalog database and software to make a complete integrated system with everything needed for archiving in an easy-to-use appliance.



Archive Appliance constituent components

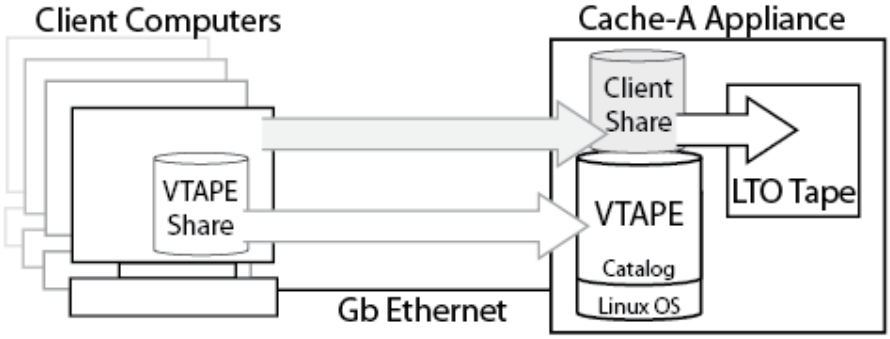
Cache-A archive appliances offer a variety of connection interfaces. Basic Network attachment is supported by a Gigabit Ethernet interface and provides the ability to mount the archive appliance internal disk storage as a "share" on any other computer on the network (or multiple computers concurrently). Data can be easily archived simply by dropping files into the shared folder, or "VTAPE" that represents the tape. From there, it is automatically

archived to tape in the background without any need for further user actions.



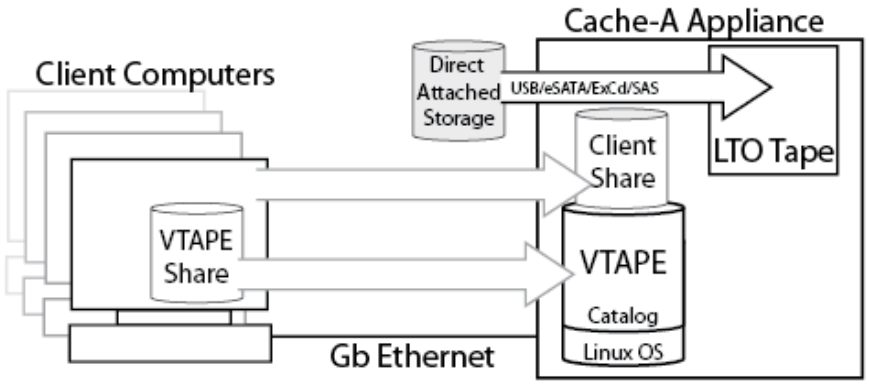
Archive Appliance VTAPE Sharing

The Gigabit Ethernet interface also allows the archive appliance to do the inverse, that is, mount any shared folder of any computer on the network itself using the "Mount Manager" facility (SMB or NFS shares only at this time). Contents of these shared folders can be archived manually using the web-page-based "File Manager" or automatically using the web-page-based "Backup Schedule" facility.



Archive Appliance Client Sharing

In addition, external storage volumes ranging from RAM cards to hard disks can be directly attached through the physical connections provided on each system. Prime-Cache systems offer 6 USB ports for this purpose. Pro-Cache systems offer 6 USB ports plus one eSATA, one ExpressCard slot and one multilane connecter with 3 lanes of SAS and one lane of SATA.



Archive Appliance Direct Attached Storage

Note that the arrows in all these diagrams show the archiving direction but in fact work equally in the other direction for restoring data.

Tape Table of Contents

Each data tape cartridge contains a table of contents (TOC) that provides a hierarchical directory of the tape's file system, allowing you to treat the contents of the tape similarly to that of a hard disk drive and giving independent access to any individual file or group of files stored on the tape. This TOC is written to the tape by the archive appliance's tape manager software after each data transfer session at the end of data (EOD). This TOC is also saved in the deck's internal Catalog which tracks all tapes it has ever seen.

System Preparation

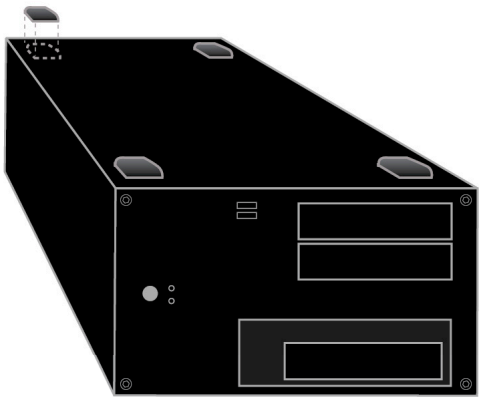
Cache-A archive appliances are designed to be used in a wide variety of environments but users should attempt to keep the system in a reasonably cool, low humidity and clean area. There is wide latitude for this within the systems specifications, but the life of tapes and the tape drive will depend to some extent on these parameters.

Prime-Cache is intended for tabletop operation and can be used standing up vertically or lying on its side with the drive toward the top (drive door opens up).

Pro-Cache is intended either for tabletop or rack-mount applications used with our rack mounting kit or on a rack tray.

Installing Pro-Cache Desktop Feet

If the system is not going to be rack mounted, invert the unit onto a soft surface to prevent scratching the top and install the 4 adhesive backed rubber feet provided.



Adding Rubber Feet to Pro-Cache

Ensure that the bottom surface of the unit is clean and dry and press each foot on each of the 4 corners of the bottom of the unit. Install the feet about ½" or 1 cm in from each corner of the unit for maximum stability. Do not install any feet if the Rack Kit is to be used.

Installing the Pro-Cache Rack Kit

One or two Pro-Cache units may be mounted in a 3RU rack space. Consult the complete instructions for rack installation that accompany each Pro-Cache rack kit.

Pro-Cache Rack Kit

Chapter 2: Getting Started

This chapter describes how to set up your Cache-A archive appliance and shows the basic approaches for archiving files.

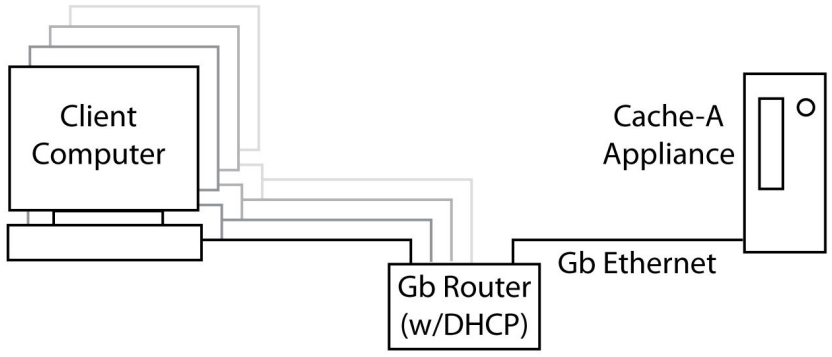
- Setting up a Cache-A archive appliance on your network
- Accessing the Cache-A archive appliance from your Browser
- Simple Archiving to a Network Share
- Simple Restoring with the Web Based File Manager

This section will get you started, however, you are encouraged to read at least the Cache-A technologies chapter to understand the power of your archive appliance.

Setting Up a Cache-A Archive Appliance on your Network

By default, Cache-A archive appliances must be connected to an Ethernet network with DHCP and will obtain a connection via an assigned IP address. This means your network needs to include at least a client computer, the Cache-A deck and a router.

You can use either of two Ethernet connections available on the back panel of the Cache-A archive appliance.



Archive Appliance Network Connection

If you want to employ a user defined static IP address you can do so from the Network Settings page of the Cache-A appliance web page (see Network Setting section for more details).

This can be done from the browser which is normally reached through the DHCP setup referenced above – or – you can connect a monitor, keyboard and mouse directly to the back panel of the unit (see Maintenance Terminal section for more details).

Warning

Static IP settings apply to the currently active Ethernet port – note which port is connected to the network when making changes.

Making this change may make your system unreachable if you forget its IP address or if you connect to the wrong port.

Once the system is connected to a DHCP network, connect power and turn on the system by pressing the power button on the front panel.

This may take a few minutes

Note that DHCP assignment and Bonjour name advertisement may take some time on some network/system combinations.

Accessing the Cache-A Web Page

In order to get started using your Cache-A Archive appliance, you will first need to access it from a browser and confirm initializing a tape as described below.

You will need to know the Host Name or Bonjour Name of your Cache-A device to proceed. The default hostname of any Cache-A Archive appliance is:

archiveXX

where *XX* is the last two digits of your serial number. For example serial #CA-P4001-30010 would be *archive10*.

Accessing the Cache-A web page on a Mac:

Either the system's **Bonjour name** or its **IP address** can be used to access the system's web page.

The Bonjour name of any Cache-A Archive appliance is:

hostname.local -or- *archiveXX.local*

where *XX* is the last two digits of your serial number. For example serial #CA-P4001-30010 would be *archive10.local*

You can access the Cache-A web page by typing the Bonjour name (*archiveXX.local*) in your browser's URL bar. If you are using Safari, you can also find the Bonjour name as a clickable link under Safari's **Bookmarks** > **Bonjour** item.

The system's **hostname** or its IP address can be used to mount the network share – you should see the hostname in the "SHARED" group in the left column of any Finder window.

Accessing the Cache-A web page on a PC:

Some PCs also have Bonjour services installed (i.e. if the PC has iTunes installed) and that would allow the same naming as noted above.

The Cache-A web page can also be accessed on most PC systems simply by typing the hostname (*archiveXX*) in your browser's URL bar.

Accessing the Cache-A web page by IP Address:

On any operating system you can always reach a Cache-A system by typing the system's IP address in the URL bar (i.e. http://192.168.1.123).

You can find your Cache-A archive appliance's router-assigned IP address by connecting to your router and viewing its DHCP assignment table. You can also connect a maintenance terminal from which you can launch Firefox and view the network settings page.

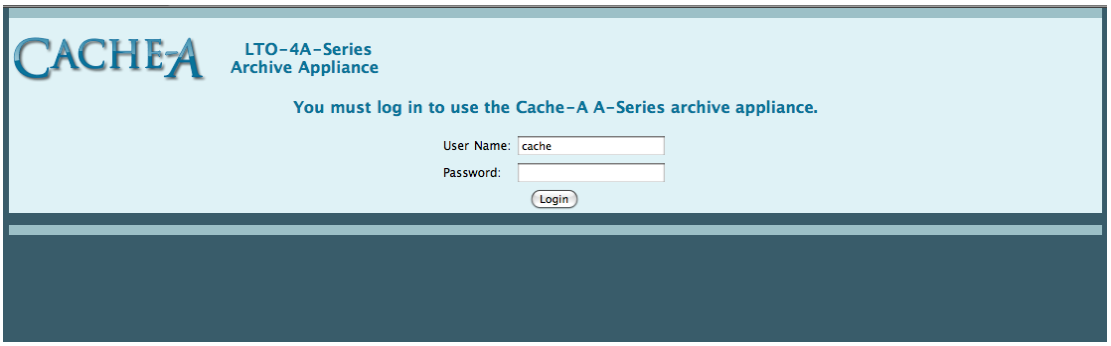
The Cache-A Archive Appliance Browser Interface

The first step towards using a Cache-A Archive appliance is to bring up its web page so you can control and monitor the system's activity. This will also allow you to initialize your first tape.

Important

NOTE: Cache-A software has been tested with Firefox and Safari web browsers – this user interface will does not work properly with Windows Internet Explorer.

When you have connected to your Cache-A system as outlined above, you will see the **Login** Page:



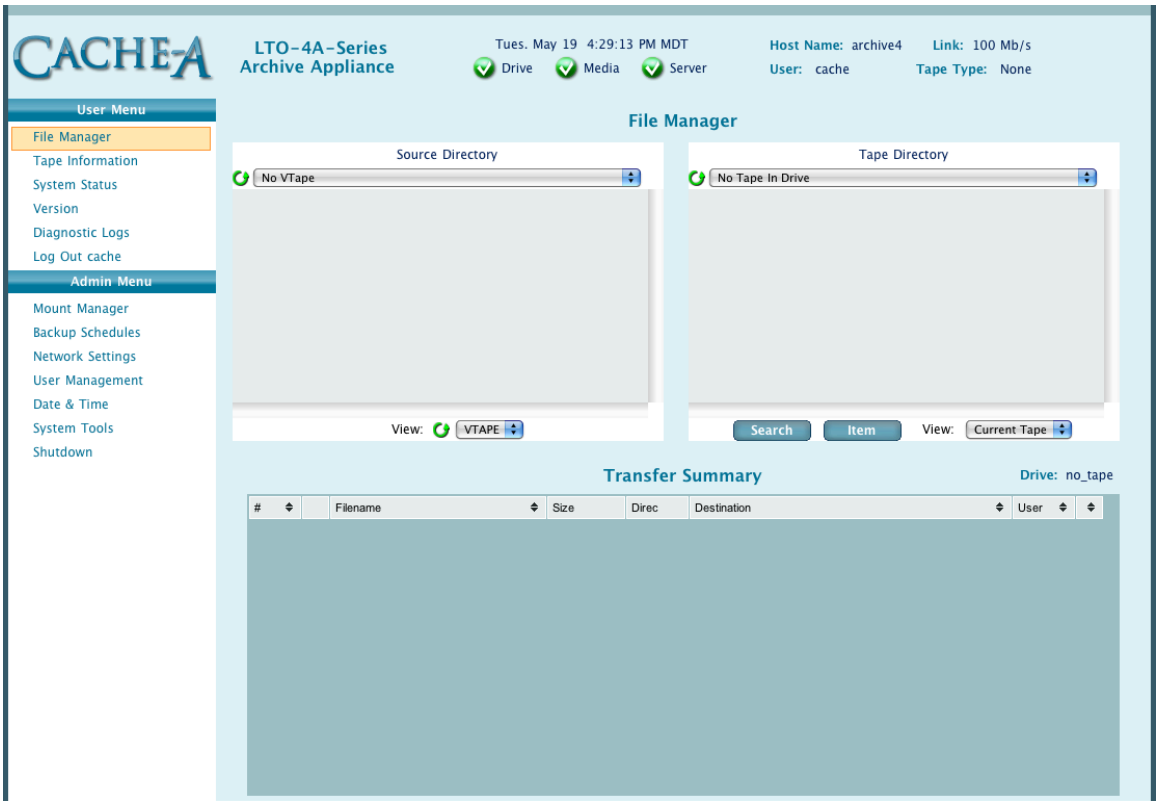
The Cache-A Archive Appliance Login Page

Type in the User Name and Password in the spaces provided:

- The default login user name is **cache**
- The associated default password is **cache123**

We recommend you keep this user and password to always have an easy way into the system, however users can be added and this password can be changed later if desired.

When you have successfully logged in, you will see the **File Manager** page:

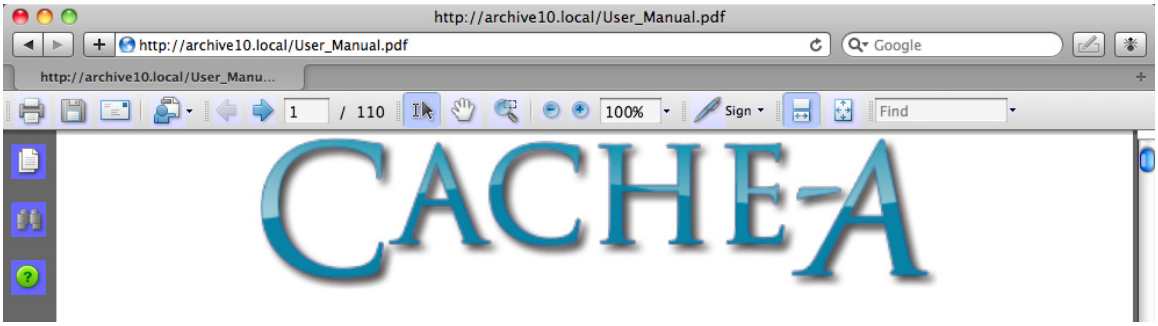


The Cache-A Archive Appliance blank File Manager Page

Important

Once you can access the Cache-A appliance's web pages, you can also access the full User Manual at:

http://archiveXX.local/User_Manual.pdf

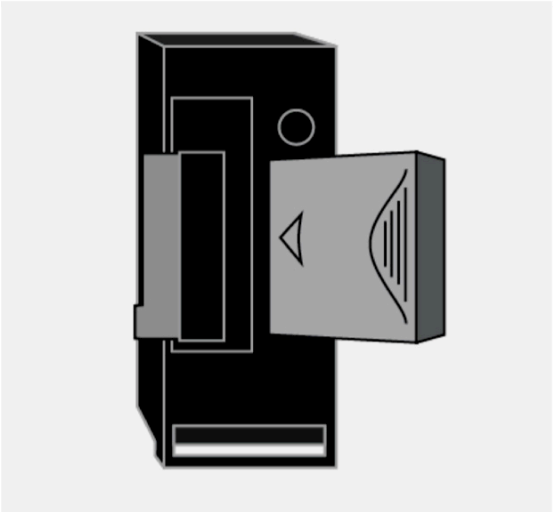


On-line Full User Manual

We ***strongly recommend*** you read the complete document to get the most out of your Cache-A archive appliance. The full manual provides detailed descriptions of each control and setting as well as extended configuration information.

Formatting a Tape

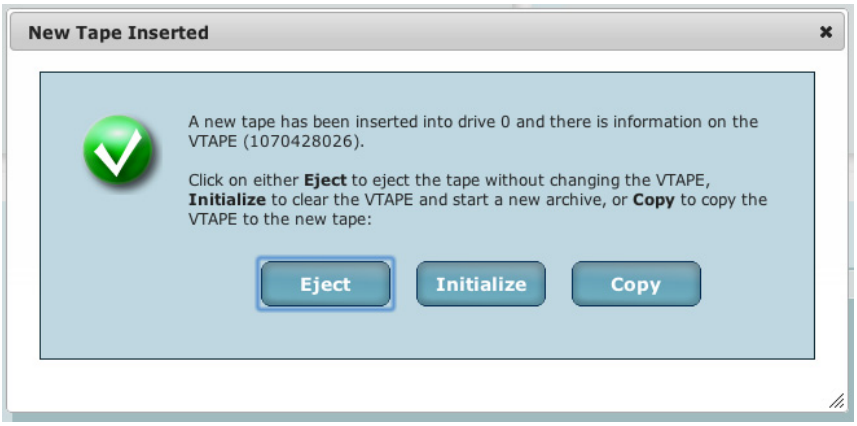
The next step towards using a Cache-A Archive appliance is to insert a blank tape. To do so, lift the flap over the drive tape hole and orient the tape so that the arrow on the top of the tape cartridge is pointing into the hole. Slide the tape in until the mechanism grabs it (which occurs about ¾" from flush) – the drive will draw the tape cartridge in and complete the insertion process.



Inserting a tape into your Archive Appliance

This may take a few moments

Once the system has threaded the tape into the drive and read the solid-state memory in the tape, it will recognize that you have inserted a new tape cartridge and present you with the following dialog:


New Tape Inserted
A new tape has been inserted into drive 0 and there is information on the VTAPE (1070428026).
Click on either Eject to eject the tape without changing the VTAPE, Initialize to clear the VTAPE and start a new archive, or Copy to copy the VTAPE to the new tape:
Eject
Initialize
Copy

Archive Appliance Initialize Tape Dialog

Select **Initialize** in this dialog and wait for the File Manager web page to update – this is complete when it shows the tape cartridge's Manufacturer's ID number in the title button over the Tape Directory List:

Archive Appliance Tape Ready for Use

You are now ready to begin archiving.

Simple Archiving to a Network Share

Cache-A Archive Appliances offer many methods to archive content. These various methods are based on accessing user data from one of the following sources:

- Via the **network shared volume** offered by the appliance where you drop content and allow it to be automatically backed up (covered below – for more detail see the Network Share Guidelines section).
- Via a **client shared volume** where the appliance mounts a folder on one or more of the computers on your network (see the Mount Manager section for more information).
- Via a **direct mounted volume** that is physically connected to the appliance's USB, SATA, SAS, or ExpressCard slot (see the Direct Mount section for more information).

The easiest way to get started archiving is to use the Network Share method.

Mount the Cache-A archive appliance to your client computer by using one of the following methods.

Mounting the share on a Mac:

The system will appear in the Finder by its Host name in the **SHARED** Item of the left column. Mount the Cache-A network share by highlighting that item and clicking on the **Connect As** button and providing your Cache-A user name and password (default: **cache**, **cache123**):

Mounting the Archive Appliance on a Mac

Cache-A shares can appear twice under the "SHARED" column as OS X systems will see both the normal Macintosh (afp) and Windows (SMB) share offered by each system. Note: you can

archive using the Windows share however, this is not recommended: you may experience name changes when illegal windows characters appear in your filenames and you may lose file metadata in resource forks (see Best Practices section for more information about this).

Mounting the share on a PC:

The system will appear in the Windows Explorer when you Search your Network Neighborhood for your appliance hostname. Mount the Cache-A network share by opening your Windows Network Neighborhood view – depending upon the windows version, the Cache-A share may be displayed automatically. If it is not, search for the windows share name **archiveXX**. You should also be able to directly locate the system by typing its explicit path as **\\ARCHIVEXX\CACHE-A**

Once the share has been found, you can mount it using standard windows techniques (i.e. "**Map Network Drive**") and the same username and password (default: **cache**, **cache123**).

Prepared to Archive

Now that you have the Archive Appliance mounted, you will see the Cache-A share containing:

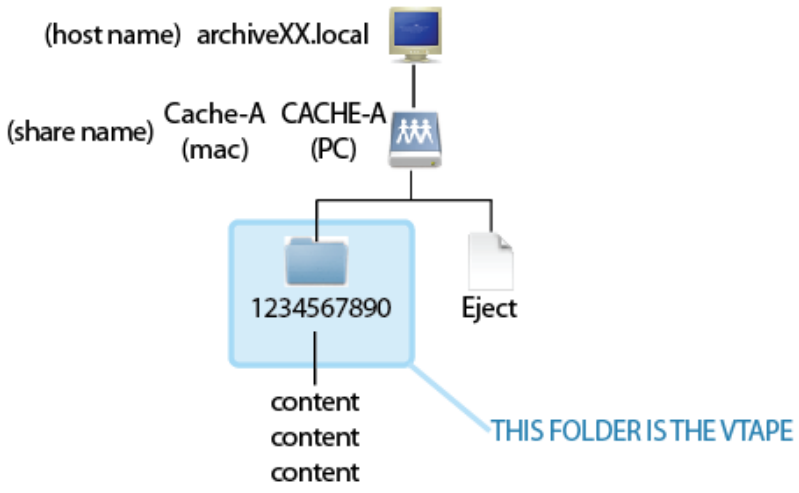
- a folder labeled with a number - this represents the tape itself (as explained below this folder is referred to as the "**VTAPE**")
- a file called **Eject** which can be used to eject the tape cartridge by dragging it to the trash or otherwise deleting it

What is the VTAPE?

The name "VTAPE" is short for "virtual tape" and is what allows the archive appliance to be shared by multiple users and to effectively mount a tape as if it were disk based storage (it is, in fact, disk storage). When we talk about the VTAPE throughout this manual – it is this folder to which we refer.

The numerical identification that initially appears on this folder is the hard coded manufacturer's unique tape cartridge ID – the appliance uses this for the tape name by default. You can rename the tape cartridge at any time and this folder will inherit whatever new name you assign. This is also known as the "Volume Name" of the tape.

The following diagram shows the structure of a Cache-A share. On a PC the share will be named “CACHE-A” and on a Mac, it will appear as “Cache-A” – the VTAPE is the folder within the share with the tape name – in this example the tape has an ID of “1234567890.”



Archive Appliance Mount Structure

Warning

NOTE: Do not delete the VTAPE folder from the Windows or Mac desktop – doing so will prevent archiving.

Do not rename the VTAPE folder from a Windows or Mac client when a tape is inserted – always use the File Manager “Rename” function for this – renaming the VTAPE folder from the client can prevent proper archiving.

To begin archiving, simply drop a folder containing your content onto the VTAPE folder. Once you have copied one or more items into the VTAPE you will also see a Transfer log and, if any problems occurred, an Error log.

For most users this is all it takes to archive – copy your files to this shared folder and the system will take care of the rest. There are many implications to this and we strongly suggest you read the “Unique Cache-A Technologies” section of this manual if you want to maximize your archiving flexibility.

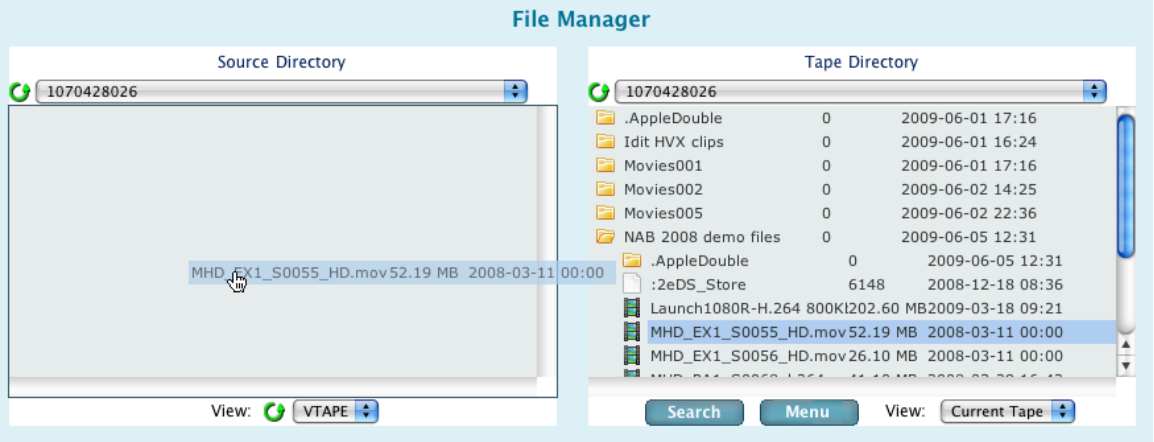
Simple Restoring with the Web Based File Manager

The Cache-A Archive Appliance File Manager web page offers tools for recovering data from your catalog of tape cartridges.

Restoring Files

Files to be restored are selected in the Tape Directory column and moved to the Source Directory column. Normally restored files are moved onto the VTAPE and from there, used as needed. Assure that this is the case by noting that "VTAPE" appears in the dropdown menu at the bottom of the column.

Navigate the contents of the current tape by double clicking folders in the Tape Directory list (see the File Manager section below for more help on navigation). Once the desired file or directory is displayed, it can be restored by simply dragging them from that list on the right to the Source Directory list on the left.



Restoring a Single File with Drag and Drop

Multiple files and/or directories can be selected using the shift key and dragged as a group to restore more than a single item.

You can also restore the entire contents of any tape by selecting the "Recover All" command from the **Menu** button.

Searching for Files

You may know what files on what tape cartridge you are interested in restoring, but frequently you will begin with a search of your catalog to find the tape containing the files with the names in which you are interested. Search for your files by selecting the

Search button and typing in all or part of the file name you are seeking.

The search results will show all of the tapes containing files that match your search string. Double clicking on any tape will "open" it and allow you to see the exact files that matched. Searching can also be used to find Barcodes and metadata as described in the Searching section of this manual.

Eject the current tape cartridge (if one is currently loaded) and insert the tape cartridge containing the files you want to restore. You can eject using the eject button on the drive's front panel or by selecting the **Menu** button and the **Eject** item in the popup menu.

Drag-and-drop any files you want to restore from the search results in the Tape Directory column to the Source Directory column to initiate a restore session.

Chapter 3: Understanding Cache-A Appliance Technologies

The Getting Started section above touches on some of the unique technologies used in Cache-A archive appliances. This chapter is devoted to explaining in more detail how these technologies are implemented, the concepts behind them and how to make the most of them.

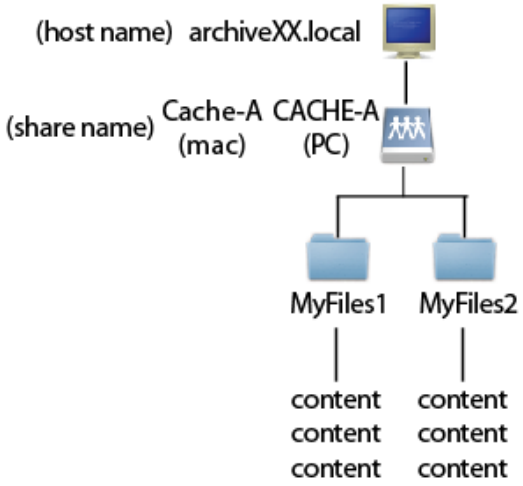
As these products contain many powerful capabilities that are different from most archive tools on the market, this section of the manual will be important to any user who wants to fully explore the uses of their archive appliance.

The Cache-A VTAPE

Cache-A's VTAPE technology is quite different from any other archiving solution. When used in its basic form (drop your files and forget them) archiving operations are incredibly simple. As soon as you want to do something different however, there are many implications that should be understood and are covered in this chapter.

As noted above, data can be easily archived simply by dropping files onto the shared folder, or "VTAPE" that represents the tape. This "Virtual Tape" is confusing to many users but is really quite simple once you understand it. The explanation in this section should make things clear.

Looking inside the Cache-A share when there is no tape present, because the VTAPE is a virtual representation of the tape, it will not be there either – thus the Cache-A share will contain only files you put there:

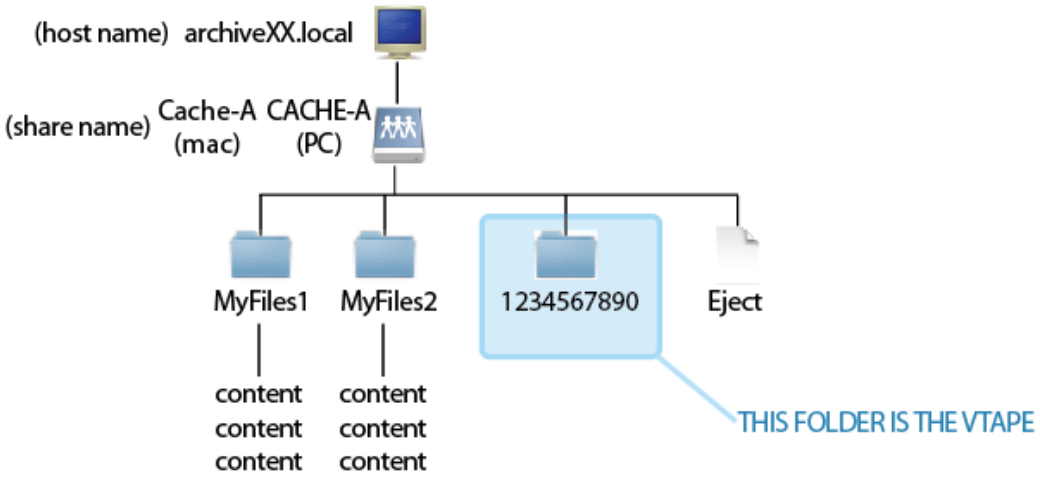


Cache-A Share with no VTAPE

Similarly, the File Manager would show the same thing:

File Manager dropdowns with no tape and thus no VTAPE

As soon as you insert a tape, the system will create a VTAPE to represent that tape (and an Eject file to allow you to eject the tape from your client):



Cache-A Share with VTAPE

And in this case, the File Manager would show the tape and the VTAPE:

File Manager dropdowns with tape and VTAPE

Important

What is important to understand is that the VTAPE is the folder inside the Cache-A share that has the same name as the tape.

Content dropped into the VTAPE will initiate archiving – content dropped onto the top level share will be copied to the Cache-A drive(s) but will not be archived until moved into the VTAPE.

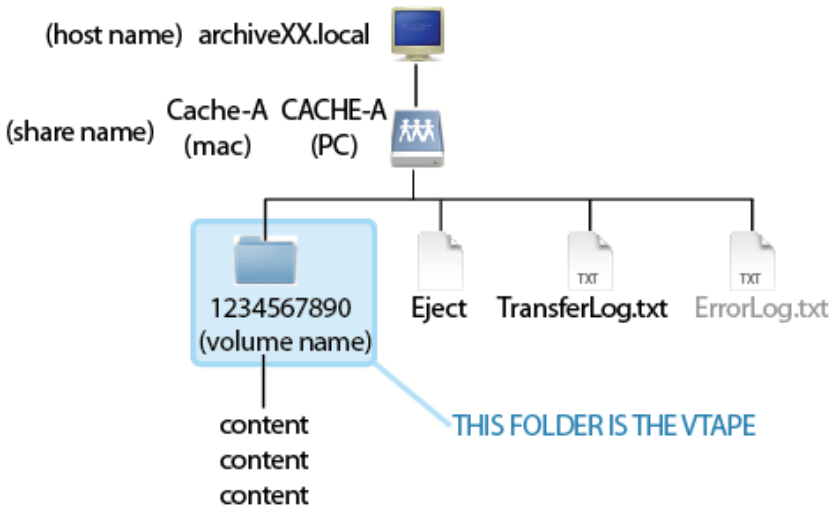
The warning in the "Getting Started" section is worth repeating in this context:

Warning

NOTE: Do not delete the VTAPE folder from the Windows or Mac desktop – doing so will prevent archiving.

Do not rename the VTAPE folder from a Windows or Mac client when a tape is inserted – always use the File Manager "Rename" function for this – renaming the VTAPE folder from the client can prevent proper archiving.

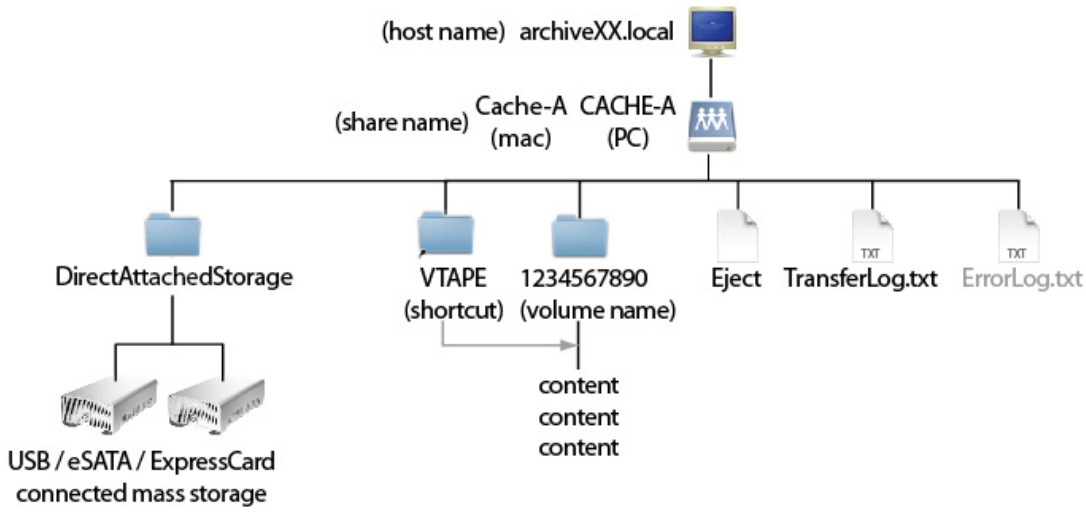
As soon as you start copying files onto the tape, either by dropping them onto the VTAPE or by other means, a transfer log file is created at the top level of the share – this log contains a full listing of the information appearing in the "Transfer Summary" of the File Manager page. If any errors occurred, an error log is also created.



Cache-A Share with VTAPE and logs after some files have been copied

As of version 1.2, the Cache-A Share can contain two additional system-created items: a link to the VTAPE and a folder

representing any additional direct attached storage devices you may have connected to your Cache-A archive appliance:



Cache-A Share with VTAPE link and Direct Attached Links enabled

These additional items are discussed further in the full manual Browser Reference section under the System Tools page > Settings tab section where they can be enabled. Be sure to review the information there before using these features.

Managing Your Content

In order to keep your content organized, you should make a practice of archiving your data already contained in folders or of creating folders on the VTAPE into which you drop files before you begin. Thousands of loose files at the top level of a tape will be difficult to manage.

Mac OS Warning

Always put all files within a folder when attempting to drag-and-drop files onto the top level of the VTAPE from the Mac OSX Finder. Failure to do so can result in data loss.

Explanation: Finder creates zero length copies of files when copying a set of individual files and then comes back around later to rewrite them with data. As of the revision level of this manual, the Cache-A system may archive the zero length copy before Finder provides the data.

Cache-A A-Series Archive Tapes do not allow the user to reorganize or rename files on the tape cartridge. Once content is archived, it will remain on the tape as archived until that tape is erased.

The Archive Appliance will archive files with the names and hierarchy they have when they are moved to the VTAPE. While you will be able move and change file names in the VTAPE but you are not changing what is on the tape. This can cause a number of problems (see below) so we strongly recommend that you not do this.

Important

The process of adding anything to the VTAPE creates an event to copy that set of files. Once the queue for copying those files to tape is completed, it doesn't matter what happens to those files on the VTAPE – that is to say, you could change names, delete files, and so on, but it will not affect what got archived. That said, note the following warning:

Warning

If you attempt to change the name of files in the VTAPE before or while they are being copied to tape, you may cause serious archiving errors.

This also implies what will be obvious if you think about it, that if you attempt to Cancel an archive while files are still being copied to the VTAPE, it will not be able to cancel since each new file copied creates a new event to archive. Thus:

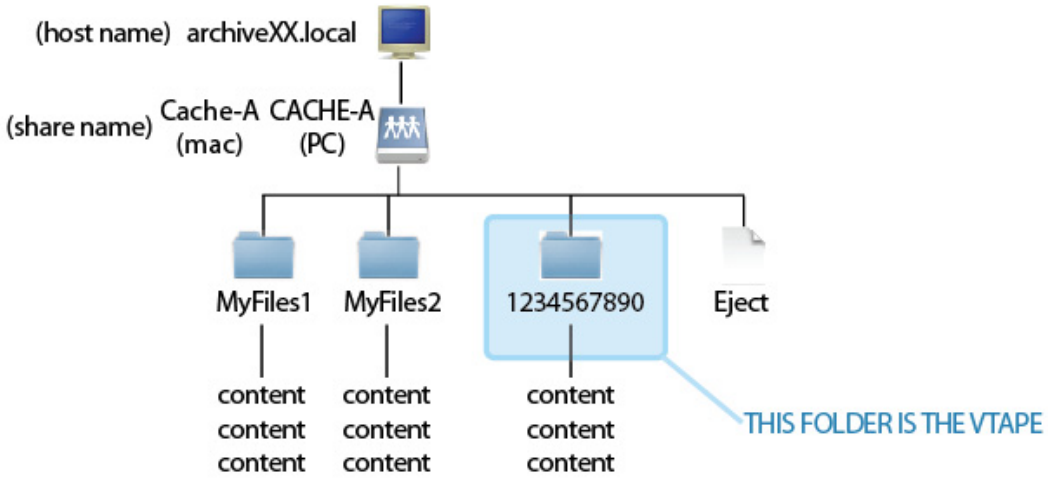
Warning

Do not attempt to Cancel a transfer while files are being copied into the VTAPE – it will NOT cancel and you will cause archiving errors.

Organizing Techniques

You can store content anywhere on the Archive Appliance share volume – only content placed into the VTAPE folder will be archived to tape.

- Placing your data at the top level of the shared volume will allow you to reorganize and rename your data prior to archiving. Once you have manipulated your files to your satisfaction, you can drag from the top level onto the VTAPE to initiate the archive-to-tape process.



Example of Using the Share to Organize Your Files

In the example above, a user has created a couple of folders "MyFiles1" and "MyFiles2" in which to organize content. Archiving will not start until you drop them into the VTAPE folder ("1234567890" in this example).

- You must manually remove any content not placed in the VTAPE in order to free up space for further archiving – failure to do so can result in insufficient space on your VTAPE to fill your LTO tape.
- For example, in the figure above, suppose you only dropped MyFiles1 into the VTAPE – MyFiles2 would still be hanging around taking up space and would not be erased when you clear the VTAPE so must be manually removed.

Cache-A VTAPE folders can be separated from their relationship to the tape if you need to use the content for a different purpose.

- If you have files in your VTAPE that you want to continue to use for any reason, you can make the contents of VTAPE into a regular folder by ejecting, not erasing the VTAPE and then renaming the folder. I.e. in the above example, after archiving to and then ejecting tape "1234567890," you could rename that folder "MyFiles3."
- This may be useful for instance if you wanted add the same set of files to several tapes or to simply continue to use the Cache-A share to work with those files.

Cache-A Tapes allow users to store multiple copies of any file with the same name in the same folder.

- Only the most recently copied version appears of each duplicated file appears in the directory list but all versions are listed in the File Info dialog with dates associated with each version. If the file already existed on the VTAPE, it will be replaced on disk, but an additional copy will still be made on tape.

- Users may want to manually change the file name of any duplicated file archives before archiving if better version tracking is needed.

- A search for any given file will return a list of all versions allowing you to access whichever version you desire for a restore.

The contents of the VTAPE folder may not contain the same information as the tape cartridge that it represents.

- This will never happen if you fill each tape cartridge, then erase the VTAPE and start fresh with the next tape.

- When you eject a tape, you will be asked if you want to erase the VTAPE – unless you have a good reason not to erase the VTAPE, you should always select **Erase.**

- One good reason to keep the contents of the VTAPE is if you want to make a second copy of the data you just archived. In this case, simply insert a new tape, and then select the **Copy** button in the **New Tape Inserted** dialog.

- As you use the system, you may have partially filled tapes, want to eject them and add different content to other tapes, etc. Under these circumstances you also may want to preserve the items in your VTAPE – please read each dialog carefully when choosing how you will manage this data.

Managing VTAPE and Physical Tape Capacity

Cache-A archive appliances take advantage of the fact that LTO series drives have hardware to losslessly compress data on the fly without impacting transfer rates or data quality. Some data will not compress at all, and some may compress up to 2:1. Because of this, either of two scenarios can cause problems: a) the VTAPE can contain more data than will fit on a tape cartridge or b) the tape cartridge can contain more data than will fit on the VTAPE.

Video professionals should never be concerned about any quality impact of this compression – it is guaranteed to have bit for bit accuracy when restoring files.

Important

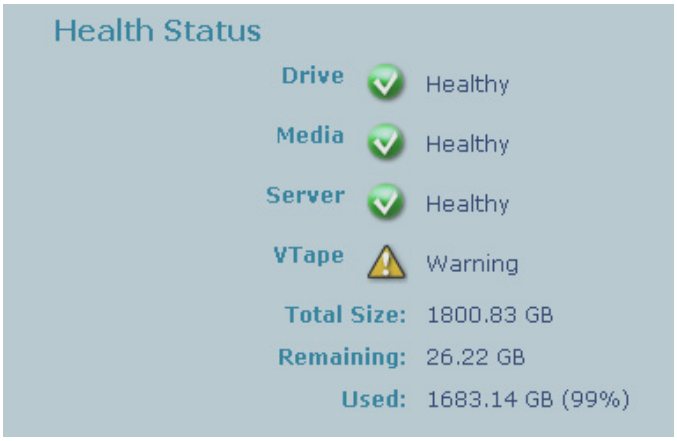
Tape and VTAPE disk capacity is normally manually managed by the user when archiving files. The **Multiple Volumes** (Tape Spanning mode) capability allows you to ignore Tape capacity as long as you have additional tapes to insert upon filling the Current Tape. The **Remove Files** (Auto VTAPE Management mode) capability allows you to ignore the VTAPE capacity as long as you have enough tapes and keep loading them to stay ahead of your data archive copying.

Multiple Volumes and Remove Files capabilities are discussed under the System Tools > Settings section. When these capabilities are not enabled, you should observe the following cautions:

- The VTAPE is a 900 GB file system* and is big enough to fill an LTO4 tape cartridge with no compression. If you were to archive only IT type data (text, spreadsheets, etc.) you could put as much as 1600 GB on the tape - the VTAPE is obviously not big enough for that all in one go, so you may have to erase it to add more data.
  * the VTAPE only on a Pro-Cache system configured for RAID0 mode is an 1800GB file system

- The Tape info window may display a negative number for Space Lost – this indicates that your data did compress somewhat. This number is actually a combined report of how much data compressed less actual losses from read-write start-stops, bad blocks, etc.

- When the VTAPE is full, it won't let you put any more on it. Thus if the tape is not full because of lossless compression, you will have to erase it or remove some data from the VTAPE in order to copy more onto the tape.



Too Much Data on the VTAPE Partition

Warning

If you put too much data on your VTAPE, the system may not have enough room left for the revised Catalog after archiving – always watch out for this warning.

- It is possible that when archiving and the tape becomes full, if there is more data on the VTAPE than will fit, the system will stop archiving files at that point.

- If you try to restore all of a tape that contains more uncompressed data than the VTAPE will hold, the restore will stop when the VTAPE file system is full.

- The system preserves enough space on tape to write the TOC so may not let you archive files even though it appears to have enough room. To assure this is always the case, it is a bad idea to try to cram every possible bit onto your tapes.

Warning

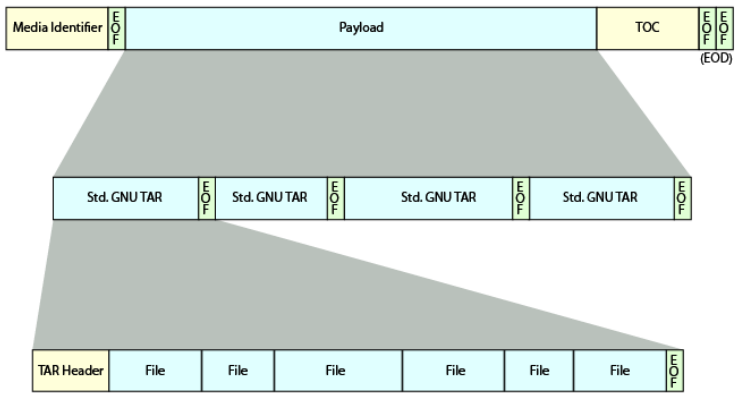
We recommend you not try to put more than 740GB per LTO-4 or 1425GB per LTO-5 tape to avoid any possible issues unless using the Multiple Volumes feature.

The A-Series Table of Contents and Catalog

Cache-A archive appliances maintain a Table of Contents (TOC) on each tape cartridge and maintain an internal searchable Catalog of every TOC it has ever seen in a database.

The TOC provides a hard disk drive-like directory of each tape cartridge file system, allowing users to view and independently access to any individual file or group of files stored on the tape cartridge. This TOC is written to the tape by the deck's tape manager software after each data transfer session is completed and is placed at the end of data (EOD).

The only way to see the TOC of a Cache-A tape is to either view the Catalog record for it or to put it in a Cache-A deck - this is the only proprietary file on Cache-A tapes. The following diagram shows how data is organized on tape and where the TOC may be found.



Cache-A Data Format on Tape

On non-A-Series LTO4 drives, it is possible to use standard GNU or POSIX compliant tar utilities (version 1.20 or greater) to un-tar an entire tape and see the full contents of any Cache-A tape. Contact Cache-A technical support for more information about using tar with our tapes in other systems.

Every LTO tape contains a cartridge Memory Information Chip (aka. the "MIC" chip or the "CM" cartridge memory) that is read upon insertion using RFID technology. This chip contains a wide variety of tape information, much of which can be viewed in the Tape Information dialog (see that section below for more information). The TOC is too big to fit in this chip and is not stored here, but the date and time last written is (along with information about the TOC's integrity).

On a system that has written any tape, there will be a copy of that tape's TOC in the Catalog. However, since the tape may have been modified in another Cache-A appliance, that copy may or may not be up-to-date, so the system uses that MIC chip to discover if in fact that has happened. As soon as any tape is loaded into any Cache-A deck, the tape ID and last written date/time is pulled from the tape's memory chip and compared to the Catalog. If it is a match, the system instantly displays the internal copy of the TOC. If that information is either not in the catalog or it is newer than the catalog, the TOC is read from tape and the Catalog is updated.

This may take some time

Reading the TOC from the tape may be very quick or can take quite a bit of time depending upon where on the tape it is stored (tape seek time can be up to 2 minutes) and how big it is (TOCs can contain a directory of hundreds of thousands of small files). The system will display a wait dialog when importing a TOC – do not interrupt this process or you will end up with a partial representation of the tape's contents in the catalog.

Managing the Catalog

Normally, the Catalog is self-maintaining and requires no user intervention. Any change you make to any tape, including erasing it, is immediately updated in the catalog. As noted above, any time you insert any tape into a deck, that TOC is added to the Catalog.

If you did not want to add that tape to your Catalog, or if you have removed a tape from your shelves, you can remove it from the

Catalog by selecting it in the Catalog List and selecting Delete from the Menu Button (see the File Manager section for more information).

The internal Catalog is stored on the local hard disk and is very unlikely ever have problems. However, in the event of a catastrophic hard disk crash, this database could be lost.

There is a user-initiated Catalog backup utility to allow you to backup the Catalog onto the VTAPE and thus onto the Current tape if loaded - this also allows you to copy it to other media such as a USB drive or any other volume. This function may be found under the Catalog Backup tab of the System Tools page (see that section for more information).

Restoring your backup Catalog will require a call to Cache-A technical support to allow our service technician to restore the database. There will be user facilities to handle this in future versions.

In a disaster scenario, if the Catalog is completely lost, you can rebuild the Catalog by inserting each tape in your collection, wait for the TOC to be read and eject. Note that this will be a time consuming effort. The best way to avoid ever having to rebuild your catalog is by making regular catalog backups.

Neither the TOC nor the Catalog have real size limitations - they grow as big as they need to be, using up tape space and VTAPE space as needed. The TOC may grow significantly from additional data but not likely to ever be a serious portion of the hundreds of Gigabytes available.

CACHE-A

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